

Exam.Code:0928  
Sub. Code: 6766

1079  
B.E. (Electronics and Communication Engineering)  
Fourth Semester  
EC-420: Electromagnetic Theory

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

- a) State Faraday's Law.
- b) Discuss the inconsistency defined by Maxwell in Ampere's law.
- c) What is a Poynting vector?
- d) Comment. "TEM mode exists in waveguide."
- e) Differentiate group velocity and phase velocity.
- f) Write down the Maxwell equations in differential form
- g) Define skin effect.
- h) Define wave polarization?
- i) What is a Cavity resonator?
- j) What is meant by dominant mode in waveguide? (10x1)

### UNIT – I

- II. a) Explain the significance of displacement current in Maxwell equations.  
b) Calculate the skin depth, propagation constant and wave velocity at a frequency of 1.6 MHz in aluminium where conductivity is 38.2 MS/m, relative permittivity is 1. (5,5)
- III. a) Discuss the analogies between Electric and Magnetic fields.  
b) Derive a relation between E, H and  $\eta$ .  
c) Explain the concept of Reflection and transmission of the wave in regard with conductors and dielectrics. (4,3,3)
- IV. a) State and prove pointing theorem. (5,5)  
b) Derive a relation for intrinsic impedance for conducting medium. (5,5)

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UNIT - II

- V. a) Differentiate waveguide and transmission line.  
b) Define quality factor  $Q$  of a waveguide. Prove that quality factor and attenuation factor are inversely proportional. (5,5)
- VI. a) A wave is propagated in a parallel plane waveguide. The frequency is 6 GHz and the plane separation is 0.03 metres; Find for the dominant mode  
i) The cut-off wavelength  
ii) the guide wavelength  
iii) Group and Phase velocities  
b) "TEM mode exists in waveguide." Comment. (6,4)
- VII. a) Write the characteristics of TE and TM mode.  
b) A rectangular waveguide is propagating in TE mode. Derive an expression for magnetic and electric field inside the guide. (4,6)

x-x-x